

Space Weather Forecast

Issued on Monday, 18 July 2022 at 01:12 Local

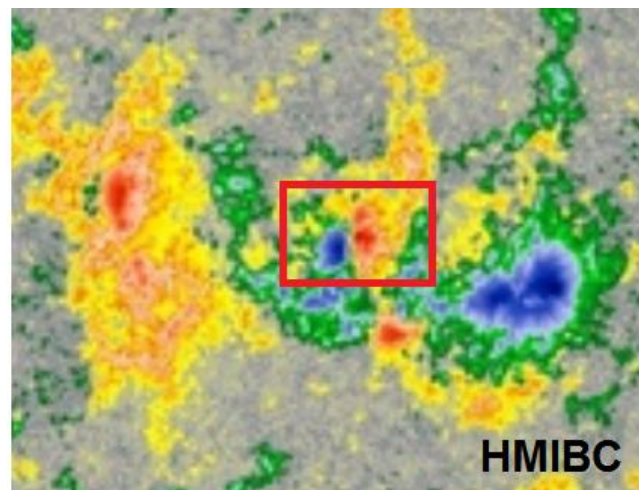
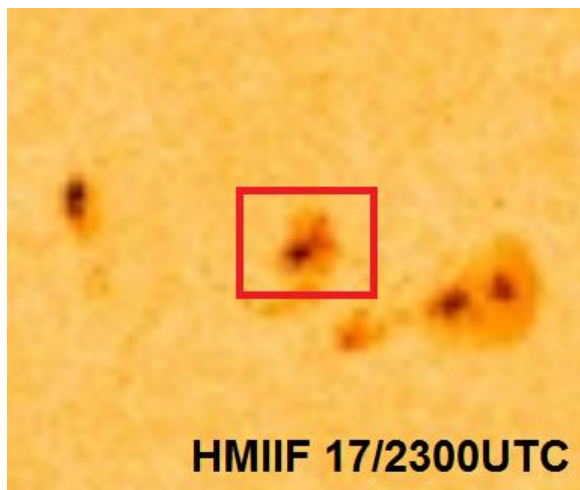
This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Moderate class X-ray flares likely at first. Chance of minor geomagnetic storms from CME arrival 19 into 20 July.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity reverted to low over the UTC day of Sunday 17 July, with X-ray activity almost entirely within common-class. Observed flares peaked with a mid-range common class at 17/1227UTC from a sunspot region in the northeast. This was one of seven sunspots on the Sun at present. A minor magnetically bipolar region was identified in the period in the northwest, as another became indistinct nearer the western solar horizon.

Figure 1: Visible and magnetic imagery of a sunspot group in the northeast of the sun, responsible for the largest flare of the past 24 hours – a middling common-class flare at 17/1227UTC. Part of the reason for its activity is shown boxed red, with two ‘umbrae’ of differing polarities (dark regions in visible image; red and blue in magnetic image) in close proximity within one ‘penumbra’ (orange containing envelope in visible image).



The main event visible in satellite imagery in the period was a fast westward-directed Coronal Mass Ejection (CME) emitted from near the fading northwestern solar horizon spot group at around 17/0200UTC. This has been modelled and is both well off the plane of the Earth's orbit and a long way west (ahead of the Earth in the track of its orbit), meaning no effect is expected at Earth. No new Earth-directed CMEs were in evidence.

Solar Wind / Geomagnetic Activity: The solar wind has been slightly elevated over the past 24 hours, likely from a waning 'coronal hole' high speed stream.

The solar wind speed was mostly slightly elevated but with a slight downward tendency. The number of particles comprising the solar wind was at normal background levels, with a slight rising

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tendency later in the period. The magnetic field associated with these particles meanwhile, showed a smooth slight decline.

The net effect of the above solar wind measures was for quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be moderate, with a daily Slight Chance of strong-class flares. Two of the current large sunspots should leave the Earth-facing side of the Sun into the new UTC week, resulting in a slight reduction in flare probability. Arriving possible sunspot regions over the southeastern solar horizon may compensate for any loss, however.

Solar Wind / Geomagnetic Activity: There is one confirmed CME in the forecast period: the 15/1300UTC 'filament' CME (arc of plasma), which is due around the turn of the UTC day 19 into 20 July. This feature ought to have some 'heft' for being spawned by a filament, and may well have a protracted transit time given the slow emission speed, giving a chance of Minor Geomagnetic Storm G1 on both 19 and 20 July, with a slight tail as late as 21 July.

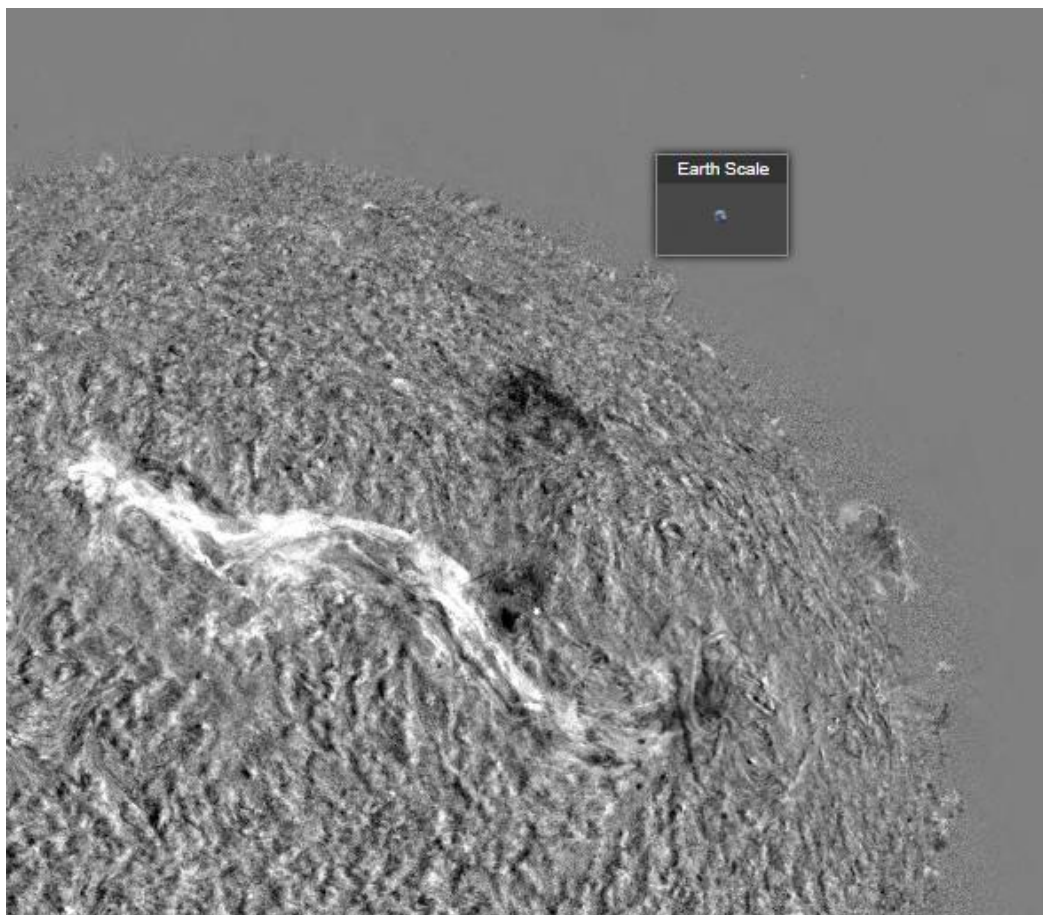


Figure 2: Heliviewer.org-generated 2-hour running difference plot in extreme UV imagery starting 15/1400UTC, showing the footprint of the large 'filament eruption' CME from 15 July in white and its trajectory during its departure from the sun in black. Also shown is the Earth for scale.

The persistence forecast is expected to be less impactful, with a minor stream of fast wind perhaps
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offering a token presence on 19 July in this expected CME-dominated period. There is then a slight chance of one of two larger coronal holes becoming geoeffective at the very end of the four days. This strengthens the tail of risk of G1 on day four, Thursday 21 July.

Geomagnetic activity should be most reliably quiet on day one, Monday 18 July, rising to a chance of G1 on 19 and 20 July, fading to a slight chance of G1 on 21 July.

Energetic Particles / Solar Radiation: Solar radiation storms are not expected in the period, but there is a daily slight chance of S1 or greater due to the presence of large sunspot regions in the central portion of the sun and the western solar hemisphere.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	40	40	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	60	50	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} $\text{sr}^{-1} \text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	10	10	10	10
Very Active	$\geq \text{S3}^*$	No	1	1	1	1
* $\text{S3} \geq 10 \text{ MeV} \geq 1000 \text{ pfu}$ and / or $\geq 50 \text{ MeV} \geq 10 \text{ pfu}$. (pfu = $\text{cm}^{-2}\text{sr}^{-1}\text{s}^{-1}$)						